Citation:

Sugimori H, Yoshida K, Izuno T, Miyakawa M, Suka M, Sekine M, Yamagami T, Kagamimori S. Analysis of factors that influence body mass index from ages 3 to 6 years: A study based on the Toyama cohort study. *Pediatr Int.* 2004 Jun;46(3):302-10.

PubMed ID: 15151547

Study Design:

Cohort (longitudinal, prospective)

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

NEUTRAL: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To elucidate environmental and behavioral factors that influence body mass index among Japanese children from ages three to six.

Inclusion Criteria:

Subjects from the Toyama Birth Cohort Study of children born between April 2, 1989 and April 1, 1990.

Overweight: BMI=90th percentile.

Exclusion Criteria:

Children with improperly obtained anthropometric measurement data.

Description of Study Protocol:

Recruitment

Selected from the Toyama Birth Cohort Study.

Design

Environmental and behavioral data: Lifestyle survey of children and history of parents and grandparents.

Lifestyle survey: Items related to meals, food items, sleep, bowel movement, physical activities, physical club activities, duration of TV viewing, and tempermental disposition.

Calculated BMI by age groups at birth, three years and six years, stratified by sex.

Categorized children into four groups derived from the temporal changes of body build between age three and six.

Group 1: Normal at both ages

Group 2: Overweight at age three, normal at age six

Group 3: Normal at age three, overweight at age six

Group 4: Overweight at both ages.

Statistical Analysis

Correlation between BMI at three and five years, Pearson's correlation coefficient statistics (significance of correlation), chi-square test (test four frequencies of factors).

Data Collection Summary:

Timing of Measurements

Baseline (1992; age 3) and follow-up (1995; age 6)

Dependent Variables

BMI

Independent Variables

Dietary consumption, snacking, juice consumption, physical activity, television viewing, child's temperament, breakfast consumption

Control Variables

Gender

Description of Actual Data Sample:

Initial N: 10,177

Attrition (final N): 8170 (4176 boys, 3994 girls)

Age: Three to six years

Ethnicity: Japanese

Location: Toyama Prefecture, Japan.

Summary of Results:

Boys and girls: Mean BMI values increased from birth year to age three and persisted to age six

(numbers in parentheses indicated category/group of child's temporal change in body build).

Boys

Significant positive associations with overweight at age six years included:

- Eating between meals (three),
- rice (three and four),
- breads (three and four),
- juices (two and three),
- green tea (three and four),
- eggs/meat (three and four),
- eating speed (two, three and four),
- duration of sleep (two, three and four),
- physical exercise (two and four),
- playing outside (two and four),
- physical club activity (three),
- TV viewing on holiday (four)
- prone to tantrums (two and four).

Girls

Significant positive associations with overweight at age six years included:

- Breakfast (two and three),
- rice (three and four),
- breads (three and four),
- eggs/meats (three),
- eating speed (two, three and four),
- bedtime (three),
- regularity of evacuation time (four),
- TV viewing on weekdays (four) and on holidays (four),
- voluntary spirit (two).

Other Findings:

- Japanese style food (rice, green tea) associated significantly with the overweight groups.
- High speed of eating was significantly associated with overweight in both genders.
- Short sleep duration (nine hours) reached statistical significance among boys.
- Early bedtime showed significant association with the girls overweight groups, and this result seems contradictory to results of short sleep duration.
- Evacuation frequency seemed to be higher among overweight groups in both genders.
- Physical inactivity significantly associated with boy overweight subjects.
- Boys' psychiatric disposition "prone to tantrums" showed significant association with overweight groups.
- For both genders, duration of TV viewing was significantly higher among overweight groups.
- Eating between meals was associated positively with the overweight group (group three) among boys. A late, high-calorie dinner was known for its association with obesity.

Author Conclusion:

Temporal changes in BMI from age three years to six years are significantly associated with both environmental and behavioral factors at age six years. Significant factors at age six years associated with the overweight body build were: Diet items (rice, green tea, eggs, meat, less bread), rapid eating, short sleep duration, early bedtime, long TV viewing, dislike of physical activity and frequent bowel movements.

Reviewer Comments:

Strengths

- *Large cohort; prospective design*

Limitations

- *Association, no causality.*
- *Reproducibility is limited.*
- *Multiple statistical testing can lead to problems (interpretation of results).*

Other Comments

- *No controlling for parental influences, total energy intake, etc.*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	N/A
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	N/A
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	N/A

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes

2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	No
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	???
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	N/A
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	???
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	Yes
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes

5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	N/A
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	N/A
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	N/A
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	No
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	No
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	No
7.5.	Was the measurement of effect at an appropriate level of precision?	No
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes

	7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**		No
	8.1.	Were statistical analyses adequately described and the results reported appropriately?	No
	8.2.	Were correct statistical tests used and assumptions of test not violated?	???
	8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
	8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
	8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	No
	8.6.	Was clinical significance as well as statistical significance reported?	???
	8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**		Yes
	9.1.	Is there a discussion of findings?	Yes
	9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**		Yes
	10.1.	Were sources of funding and investigators' affiliations described?	Yes
	10.2.	Was the study free from apparent conflict of interest?	Yes